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ADDENDUM NUMBER 1

NOISEMAP 4.4 COMPUTER PROGRAM UPDATE — OPERATOR'S MANUAL

RICHARD D. HORONJEFF

BOLT BERANEK AND NEWMAN INC.
21120 VANOWEN ST.
CANOGA PARK CA 91303

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AIR FORCE AEROSPACE MEDICAL RESEARCH LABORATORY
AEROSPACE MEDICAL DIVISION
AIR FORCE SYSTEMS COMMAND
WRIGHT-PATTERSON AIR FORCE BASE OHIO 45433

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TECHNICAL REVIEW AND APPROVAL

AFAMRL-TR-78-109
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This report has been reviewed by the Office of Public Affairs (PA) and is releasable to the National Technical Information Service (NTIS). At NTIS, it will be available to the general public, including foreign nations.

This technical report has been reviewed and is approved for publication.

FOR THE COMMANDER

HENNING E. VON GIERKE, Dr Ing
Director
Biodynamics and Bioengineering Division
Air Force Aerospace Medical Research Laboratory

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This report, an addendum to AMRL-TR-78-109, describes new capabilities for the NOISEMAP program that allow calculation of the daily noise exposure at 20 user-specified locations. The program also produces a detailed listing of the aircraft flight and ground operations which are the greatest contributors to the daily noise exposure at each specified location.

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I. INTRODUCTION

This report documents the enhanced features of NOISEMAP 4.4 over the predecessor version 4.2. Originally developed in 1971, NOISEMAP is a general purpose digital computer program which creates noise exposure maps for land areas surrounding civil and military air installations. The programs have been written in FORTRAN IV and optimized for execution on Control Data Corporation (CDC) 6000, 7000, and Cyber 170 series computers.

Input to the software package consists of aircraft noise and performance data and air installation operational characteristics such as runway layouts, approach and departure flight tracks, navigational aids, etc. The program creates a rectangular grid mesh overlay of the air installation and surrounding areas and computes indices of daily noise exposure from aircraft flight and ground operations at each mesh point. The resulting mesh point values along with geographic annotation are output to a general purpose terrain contouring program which produces hard copy maps to any desired scale. The program is also capable of saving computational results in machine readable form for later recall and manipulation. The rectangular grid mesh of 100 by 100 gridpoints may also be output in printed form if tabular output is desired. For a complete program description the reader is directed to U.S. Air Force Report AMRL-TR-78-109.

NOISEMAP 4.4 is fully upward compatible with all predecessor versions. Any input deck used with earlier versions will produce identical results and output when used with version 4.4. Enhancements found in version 4.4 focus on the need to provide detailed noise exposure information at specific ground locations.

The new capabilities allow the user to identify up to 20 specific ground locations by their x-y coordinates. The program will not only compute the daily noise exposure at these locations, but will also maintain a running file of the aircraft operations which are the greatest contributors to the daily noise exposure at each location. At the end of computations the program will automatically produce a detailed listing of both the aircraft flight and ground runup operations and their incremental contribution to the total daily noise exposure at each specific ground location.

II. NEW INPUT CARDS

Table I shows the four new input cards recognized by NOISEMAP 4.4. To identify a specific ground location to the program use the SPECIF card (up to 20 are allowed). This card contains four parameters. The first two are the x and y coordinates of the ground location. The coordinates must be supplied in the same reference coordinate system used by the AIRFLD, RUNWAY, and RNPPAD cards. The second two parameters are optional and may be left blank. The label parameter provides a means for attaching a four character label to the specific ground locations in graphic output; it is also printed on the specific point summary pages at the end of the NOISEMAP run. The reference runway parameter (if included) directs the program to describe the location of the point in terms of its distance from the beginning of the named runway and its offset (left or right) of the extended centerline. This description is then included on the summary pages at the end of the NOISEMAP run. This option is useful for verifying that the x-y coordinates of the point have been entered correctly. Note that named runway must match the four character label found in columns 71-74 of the RUNWAY card.

A listing of the specific ground locations known to the program may be requested at any time by the LSPECI card. This card directs the program to generate a short list of all specific point cards entered since the last AIRFLD card was encountered. Note that upon encountering an AIRFLD card the program deletes all specific points and resets the specific point processing mode to no-process.

The SPROCE card directs the program to process flight and runup activity at the specific points. This card is analogous to the

TABLE 1. NEW DATA CARDS FOR NOISEMAP 4.4

Cols 1-6	Cols 7-14	Cols 15-22	Cols 71-74	Cols 75-78
SPECIF[1]	X-coordinate	Y-coordinate	label	reference R/W
LSPECI[2]	--	--	--	--
SPROCE[3]	--	--	--	--
NSPROC[4]	--	--	--	--

(1) Enter a specific ground location by X, Y coordinates. The label will be printed on chronicle summary listing pages and on plotted output. Printed output will contain distance and offset from beginning of reference runway (if specified).

(2) List all specific ground locations.

(3) Enable specific ground location processing (operates independently of PROCES card).

(4) Disable specific ground location processing (operates independently of NOPROC card).

PROCES card which controls grid point processing. With these two cards users have independent control over grid point and specific point processing. Please note that the SPROCE card must be present after the AIRFLD card since the AIRFLD card returns specific point processing to no-process mode.

The NSPROC card explicitly directs the program to enter no-process mode. It is analogous to the NOPROC card for grid point calculations.

III. SAMPLE DATA INPUT AND OUTPUT

Figure 1 shows sample specific point information as part of the NOISEMAP input deck. Note that the SPROCE card has been placed after the AIRFLD card (for reasons described in Section II). Twelve specific locations have been described to the program, each with its own x-y coordinate pair, label and reference runway (there is only one runway in this example, 16/34).

Figure 2 shows the first page of the Chronicle output listing. The listing confirms that specific point processing mode has been entered and echos the information on each of the specific point cards (locations 9 through 12 are on the next Chronicle page and are not shown here).

Figures 3 and 4 provide an example of the two summary pages printed for each specific point at the conclusion of the NOISEMAP run. The first page gives a summary of flight activity, the second page a summary of ground runup activity. At the top of the page the specific point in identified by the label parameter entered on the SPECIF card. The x-y coordinates are also shown along with the range and offset from the reference runway which was also entered on the SPECIF card. Immediately below this general descriptive material is a detailed description of the top eighteen flight contributors to the daily noise exposure at this ground location. The flight contributors are rank ordered by their daily exposure contribution, starting with the most significant and ending with the least significant. Each flight activity shown is the result of a single FLIGHT card. The identifying parameters shown include the aircraft number, mission number and flight track. Power setting and airspeed information are extracted from the COMMENT cards within the applicable SEL deck for the particular aircraft. If this information could not be

```
AIRFLD100000. 200000. 21.5                                                    EAST
      MCCHORD AFB WASHINGTON - DATA FOR JULY 1979 TO MARCH 1980
COMMENT    MCCHORD AFB DATA FROM MAN, INC. AV. OPSNS JULY 79-MAR.80.176 BUSY DAYS
COMMENT          AIRCRAFT ARE GROUPED INTO THE FOLLOWING GROUPS:
COMMENT            C141       INCLUDING  C140 C144
COMMENT            T33        INCLUDING  T33 T37 T43 AT-10 T3
COMMENT            F106       INCLUDING  F100 F101 F105 F111 F15 F4
COMMENT                       ALSO RF4C A4 A6 A7 AV8 AV8A A6LP AV8 TA4 TA7
COMMENT            C130       INCLUDING RF27 C103A
COMMENT            TG1   C9   INCLUDING  C9/A C9A C9F
COMMENT            TG2 KC135 INCLUDING DC8 B57 E3 C735
COMMENT            TG3   A37 INCLUDING A3 A38 F5 T38 F0
COMMENT            TG4  C130 INCLUDING C117 C118 C123 P3 L188 L382 DH5
COMMENT                       ALSO DC9 DC10 DH5 TG4C L18 P3A TC4
COMMENT            C5         INCLUDING 747 B747
COMMENT    FIRST LISTED AIRPLANE IS MODEL FOR NOISE & PERFORMANCE DATA
COMMENT
COMMENT    **** NOISE MONITOR LOCATIONS GO HERE ****
SPROCE
SPECIF   149929   256500                                                      01 34
SPECIF   149804   276999                                                      02 34
SPECIF   151948   253512                                                      03 34
SPECIF   152448   253540                                                      04 34
SPECIF   150006   244000                                                      05 16
SPECIF   150074   233000                                                      06 16
SPECIF   153574   233022                                                      07 16
SPECIF   153292   230020                                                      08 16
SPECIF   150221   209001                                                      09 16
SPECIF   145557   251973                                                      10 34
SPECIF   154969   250031                                                      11 34
SPECIF   149840   271000                                                      12 34
COMMENT
COMMENT
COMMENT      NAVIGATION AID LOCATIONS
COMMENT
NAVAID129721. 202620.                                                        LAC
RUNWAY150000. 245000. 149938. 255099.                  2.9                    34
COMMENT          34A = STD. INSTR. DEPARTURE - MF - RUNWAY 34
FLTTRK34000.          3400.   -90.    200000.                                TKOF34A
```

FIGURE 1. PORTION OF INPUT CARD DECK SHOWING SPECIFIC POINT INPUT INFORMATION

```
84/08/09.MCCHORD AFB WASHINGTON - DATA FOR JULY 1979 TO MARCH 1980        PAGE     1
 DNL
 ----------------------------------------------------------------------------

   ***  NEW AIRFIELD  MCCHORD AFB WASHINGTON - DATA FOR JULY 1979 TO MARCH 1980

                      EXTERNAL LOCATION OF GRID ORIGIN  X =  100000. Y =  200000.
                      MAGNETIC DECLINATION  21.5 DEG TO EAST
                      FIELD ALTITUDE        0.0 FT CORRECTION  0.0 DB
                      GRID SPACING IS   1000.0 FT CONTOUR PGM SPACING   1000.0 FT
                      OPTIONS     PROGRAM WILL ANALYZE INPUT DATA  (ENGLISH UNITS)
                                  BUT NO PROCESSING WILL BE DONE
                                  FOR DAY-NIGHT AVERAGE LEVEL  CALCULATIONS
                                  USING NO   TONE CORRECTION NO   RUNUP WEIGHTING
                                  DATA BASE CARRIED FORWARD UNCHANGED

                      FILES KNOWN TO PROGRAM
                      UNIT 10 BINARY WITH    0 DUMPS

   COMMENT    MCCHORD AFB DATA FROM MAN, INC. AV. OPSNS JULY 79-MAR 80,176 BUSY DAYS
   COMMENT         AIRCRAFT ARE GROUPED INTO THE FOLLOWING GROUPS:
   COMMENT           C141       INCLUDING  C140 C144
   COMMENT           T33        INCLUDING  T33 T37 T43 AT-10 T3
   COMMENT           F106       INCLUDING  F100 F101 F105 F111 F15 F4
   COMMENT                      ALSO RF4C A4 A6 A7 AV8 AV8A A61P AV8 TA4 TA7
   COMMENT           C130       INCLUDING RF27 C103A
   COMMENT           TG1   C9   INCLUDING  C9/A C9A C9F
   COMMENT           TG2 KC135  INCLUDING DC8 B57 E3 C735
   COMMENT           YG3   A37  INCLUDING A3 A38 F5 T38 F0
   COMMENT           TG4  C130  INCLUDING C117 C118 C123 P3 L188 L382 DH5
   COMMENT                      ALSO DC9 DC10 DH5 TC4C L18 P3A TC4
   COMMENT           C5         INCLUDING 747 B747
   COMMENT    FIRST LISTED AIRPLANE IS MODEL FOR NOISE & PERFORMANCE DATA
   COMMENT
   COMMENT    **** NOISE MONITOR LOCATIONS GO HERE ****

   ***  ENTER SPECIFIC POINT PROCESSING MODE


   ***  ENTER SPECIFIC LOCATION  01  AT X =  149929. Y =   256500. FT
                                     (REF RUNWAY = 34  )

   ***  ENTER SPECIFIC LOCATION  02  AT X =  149804. Y =   276999. FT
                                     (REF RUNWAY = 34  )

   ***  ENTER SPECIFIC LOCATION  03  AT X =  151948. Y =   253512. FT
                                     (REF RUNWAY = 34  )

   ***  ENTER SPECIFIC LOCATION  04  AT X =  156448. Y =   253540. FT
                                     (REF RUNWAY = 34  )

   ***  ENTER SPECIFIC LOCATION  05  AT X =  150006. Y =   244000. FT
                                     (REF RUNWAY = 16  )

   ***  ENTER SPECIFIC LOCATION  06  AT X =  150074. Y =   233000. FT
                                     (REF RUNWAY = 16  )

   ***  ENTER SPECIFIC LOCATION  07  AT X =  153574. Y =   233022. FT
                                     (REF RUNWAY = 16  )

   ***  ENTER SPECIFIC LOCATION  08  AT X =  153292. Y =   230020. FT
                                     (REF RUNWAY = 16  )
```

FIGURE 2. PORTION OF CHRONICLE LISTING SHOWING SPECIFIC POINT INPUT INFORMATION

SUMMARY OF AIRCRAFT FLIGHT OPERATIONS AT SPECIFIC GROUND LOCATION G1

X = 149929.0 FT Y = 256500.0 FT
(11500.2 FT FROM START OF RUNWAY 34 ... .4 FT LEFT OF CENTERLINE)

RANK	1	2	3	4	5	6
AIRCRAFT	78	2	78	27	27	27
MISSION	107	101	101	103	1041	101
FLIGHT TRK	34D	34A	34A	34B	16B1	34A
POWER	106 % RPM	2.45 EPR	106 % RPM	1.90 EPR	1.20 EPR	1.90 EPR
AIRSPEED	350 KTS	199 KTS	350 KTS	250 KTS	140 KTS	250 KTS
ALTITUDE	405 FT	507 FT	1684 FT	1000 FT	96 FT	1000 FT
SLANT DIST	406 FT	509 FT	1738 FT	1002 FT	96 FT	1002 FT
ELEV ANGLE	86.67 DEG	85.51 DEG	75.62 DEG	86.00 DEG	88.09 DEG	86.00 DEG
EVENTS DAY	3.700	.360	6.980	16.660	2.110	7.070
NIGHT	0.000	.070	.310	.140	.020	.740
SEL	118.57 DB	122.28 DB	107.52 DB	104.85 DB	113.19 DB	104.86 DB
DNL	74.85 DB	73.14 DB	68.16 DB	68.02 DB	67.43 DB	67.06 DB
CUMUL DNL	74.85 DB	77.09 DB	77.61 DB	78.06 DB	78.42 DB	78.73 DB

RANK	7	8	9	10	11	12
AIRCRAFT	27	2	27	27	2	78
MISSION	105	116	111	1061	1041	111
FLIGHT TRK	34C	34H	16E	16C1	16B1	16E
POWER	1.90 EPR	2.45 EPR	1.20 EPR	1.20 EPR	1.75 EPR	93 % RPM
AIRSPEED	250 KTS	199 KTS	140 KTS	140 KTS	160 KTS	200 KTS
ALTITUDE	713 FT	507 FT	121 FT	149 FT	96 FT	121 FT
SLANT DIST	723 FT	509 FT	121 FT	149 FT	96 FT	121 FT
ELEV ANGLE	80.54 DEG	85.51 DEG	87.07 DEG	85.91 DEG	88.09 DEG	87.07 DEG
EVENTS DAY	6.720	.240	.940	.780	.030	1.280
NIGHT	.040	0.000	.090	0.000	.030	.080
SEL	107.92 DB	122.28 DB	113.18 DB	113.19 DB	116.69 DB	107.68 DB
DNL	67.04 DB	66.68 DB	66.43 DB	62.71 DB	62.48 DB	61.47 DB
CUMUL DNL	79.01 DB	79.26 DB	79.48 DB	79.57 DB	79.66 DB	79.72 DB

RANK	13	14	15	16	17	18
AIRCRAFT	2	2	3	78	78	3
MISSION	111	103	107	103	116	101
FLIGHT TRK	16E	34B	34D	34B	34H	34A
POWER	1.75 EPR	2.45 EPR	100 % RPM	106 % RPM	106 % RPM	100 % RPM
AIRSPEED	160 KTS	199 KTS	300 KTS	350 KTS	350 KTS	300 KTS
ALTITUDE	121 FT	507 FT	415 FT	1684 FT	1684 FT	840 FT
SLANT DIST	121 FT	509 FT	416 FT	1738 FT	1738 FT	843 FT
ELEV ANGLE	87.07 DEG	85.51 DEG	87.02 DEG	75.62 DEG	75.62 DEG	84.54 DEG
EVENTS DAY	.100	.050	.450	1.780	.970	1.060
NIGHT	.010	0.000	0.000	.010	.010	.030
SEL	116.68 DB	122.26 DB	112.31 DB	106.09 DB	107.52 DB	106.43 DB
DNL	60.29 DB	59.85 DB	59.44 DB	59.43 DB	58.41 DB	58.36 DB
CUMUL DNL	79.77 DB	79.81 DB	79.85 DB	79.89 DB	79.92 DB	79.95 DB

FLIGHT DNL	80.08 DB
TOTAL DNL	80.09 DB

FIGURE 3. PORTION OF CHRONICLE LISTING SHOWING SPECIFIC POINT OUTPUT INFORMATION - FLIGHT SUMMARY

SUMMARY OF AIRCRAFT RUNUP OPERATIONS AT SPECIFIC GROUND LOCATION 01

X = 149929.0 FT Y = 256500.0 FT
(11500.2 FT FROM START OF RUNWAY 34 ... .4 FT LEFT OF CENTERLINE)

	RANK	1	2	3	4	5	6
	AIRCRAFT	27	27	27	27	27	27
	THRUST	95	70	95	95	95	95
	RUNUP PAD	RAMP J3	RAMP J1	RAMP J9	RAMP J7	RAMP J11	RAMP B8
	POWER	95 % NF	70 % NF	95 % NF	95 % NF	95 % NF	95 % NF
SLANT	DIST	2062 FT	2174 FT	3161 FT	3235 FT	3800 FT	2042 FT
	ANGLE	-149.4 DEG	-159.8 DEG	-145.6 DEG	-152.7 DEG	-161.4 DEG	-172.1 DEG
TIME	DAY	19.2 SEC	4680.0 SEC	41.4 SEC	15.6 SEC	13.2 SEC	3.0 SEC
	NIGHT	0.0 SEC	0.0 SEC	0.0 SEC	0.0 SEC	0.0 SEC	0.0 SEC
	A-LEVEL	88.11 DB	61.78 DB	81.79 DB	80.94 DB	76.77 DB	82.48 DB
	DNL	51.54 DB	49.09 DB	48.56 DB	43.47 DB	38.57 DB	37.85 DB
	CUMUL DNL	51.54 DB	53.50 DB	54.71 DB	55.02 DB	55.12 DB	55.20 DB

	RANK	7	8	9	10	11	12
	AIRCRAFT	27	27	27	27	27	27
	THRUST	95	95	95	95	95	70
	RUNUP PAD	RAMP J5	RAMP D29	RAMP D27	RAMP C6	RAMP D26	RAMP J6
	POWER	95 % NF	95 % NF	95 % NF	95 % NF	95 % NF	70 % NF
SLANT	DIST	2839 FT	6218 FT	6161 FT	4661 FT	6139 FT	2795 FT
	ANGLE	-150.5 DEG	-161.0 DEG	-164.2 DEG	136.6 DEG	-165.8 DEG	-146.5 DEG
TIME	DAY	1.8 SEC	55.2 SEC	48.6 SEC	7.2 SEC	16.8 SEC	79.2 SEC
	NIGHT	0.0 SEC	0.0 SEC	0.0 SEC	0.0 SEC	0.0 SEC	0.0 SEC
	A-LEVEL	83.58 DB	67.59 DB	67.08 DB	75.17 DB	66.71 DB	59.68 DB
	DNL	36.73 DB	35.61 DB	34.54 DB	34.35 DB	29.57 DB	29.27 DB
	CUMUL DNL	55.26 DB	55.31 DB	55.34 DB	55.38 DB	55.39 DB	55.40 DB

	RANK	13	14	15	16	17	18
	AIRCRAFT	27	6	6	27	6	27
	THRUST	95	1400	1400	95	1400	95
	RUNUP PAD	RAMP D3	RAMP C1	RAMP C10	RAMP D30	RAMP C4	RAMP B6
	POWER	95 % NF	1400 IN-LB	1400 IN-LB	95 % NF	1400 IN-LB	95 % NF
SLANT	DIST	6313 FT	4705 FT	4886 FT	6254 FT	4449 FT	2248 FT
	ANGLE	-163.5 DEG	132.7 DEG	140.7 DEG	-159.4 DEG	135.7 DEG	-179.4 DEG
TIME	DAY	13.2 SEC	67.2 SEC	59.4 SEC	3.6 SEC	34.2 SEC	1.2 SEC
	NIGHT	0.0 SEC	0.0 SEC	0.0 SEC	0.0 SEC	0.0 SEC	0.0 SEC
	A-LEVEL	66.54 DB	56.48 DB	55.76 DB	67.76 DB	57.71 DB	71.99 DB
	DNL	28.35 DB	25.36 DB	24.10 DB	23.92 DB	23.65 DB	23.38 DB
	CUMUL DNL	55.41 DB	55.41 DB	55.42 DB	55.42 DB	55.42 DB	55.42 DB

RUNUP DNL 55.43 DB
TOTAL DNL 80.09 DB

FIGURE 4. PORTION OF CHRONICLE LISTING SHOWING SPECIFIC POINT OUTPUT INFORMATION - GROUND RUNUP SUMMARY

found "--N/A--" will be printed. The altitude, slant distance and angle of elevation above the ground plane are obtained from the closest point of approach of the aircraft to the ground location. The number of daytime and nightime events are extracted from the relevant FLIGHT card. The sound exposure level (SEL) from the aircraft is also provided. Immediately below the SEL the day-night average level contribution of the particular aircraft is shown, followed by the cumulative day-night average level which is the sum of the particular aircraft activity and all others of higher rank.

In the lower right hand corner the total day-night level for all flight activity is shown. This number reflects not only the top eighteen contributors shown, but also the contributors of lower rank not included on the summary page. The total day-night level for combined flight and runup activity is shown immediately below and is the total daily exposure at the site.

On the succeeding page (Figure 4) the analogous information for ground runup activity is shown. The lower right hand corner contains the runup day-night level total and the combined flight and runup day-night level total.

Figure 5 shows an example of graphic output. The specific locations are shown as squares with an interior X. The label entered on the SPECIF card is placed at the upper right of the square.

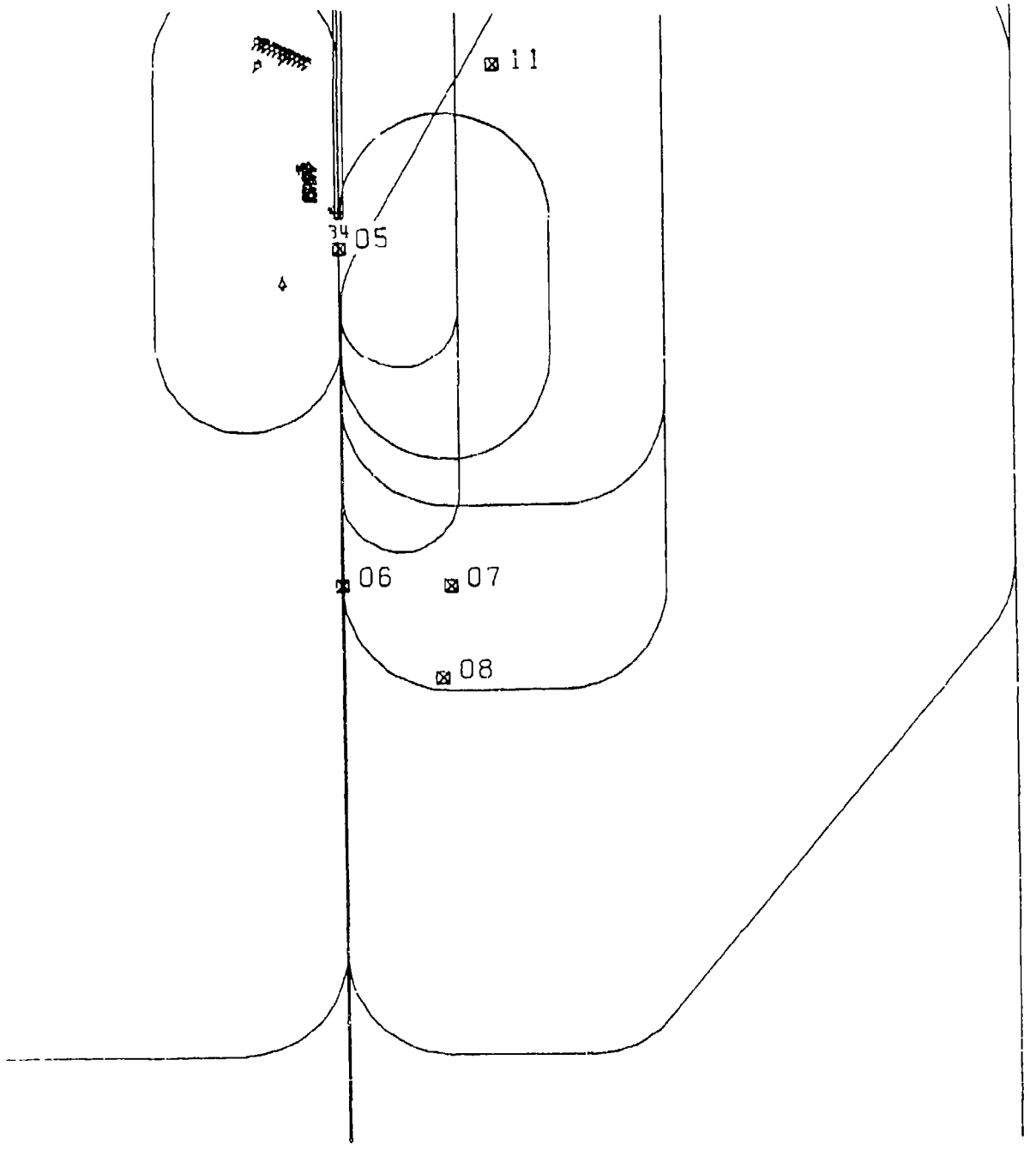

FIGURE 5. FLIGHT TRACK AND RUNWAY MAP SHOWING SPECIFIC POINT LOCATIONS

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